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Traumatic Head Injury Exercise

Instructor's Copy

Behavioral Research Aspects of Safety and Health Group (BRASH)
Institute for Mining and Minerals Research (IMMR)
University of Kentucky, Lexington, Kentucky

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This latent image exercise was developed and field tested under U. S. Bureau of Mines research Contract No. HO348040. Information about the design and characteristics of the exercise and the field test results are available in the project technical reports filed with the Bureau of Mines Research Center in Pittsburgh, PA. This is one of more than 30 exercises designed for use in annual refresher training to teach and test critical skills for coping with mine emergency situations. The views and conclusions contained in this document are those of the authors and should not be interpreted as necessarily representing the official policies or recommendations of the Interior Department's Bureau of Mines or the U. S. Government.

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Appendices

- Appendix A: Problem booklet (duplicate this copy for use in class)
- Appendix B: Answer sheet blank (print the latent image answers on this)
- Appendix C: Latent image answers (print these on the answer sheet)

Introduction

This document contains most of the materials needed to use the exercise. The main part of the document is the instructor's copy. It tells how to use the exercise, presents the objectives, the master answer sheet, the scoring key, and discussion notes to be used following the exercise. The next section summarizes results from field tests of the exercise, and reports the miners' evaluation of the activity. The last part of this document is three appendices. Appendix A is the exercise problem booklet. This booklet can be duplicated locally. The booklets are reusable. One is needed for every person in the classroom. Appendix B is the answer sheet and the trainee's questionnaire. Copies of this answer sheet must have the latent image (invisible) ink answers that appear in Appendix C printed on them.[1] Answer sheets are consumable. One is needed for each person or each small group of persons who work the exercise.

Exercise Summary

Read this section first. It determines if the exercise is appropriate for your classes. If you choose to use the exercise, examine the table of contents and review the remainder of this document.

Type: Latent image

Length: Eight questions (20 minutes for administration plus 30 minutes for discussion)

Skills: Anticipating and preventing a haulage accident
Recognizing hazardous overhanging brows and their potential for injuries to equipment operators
Suggesting ways to correct or overcome the hazard
Conducting a primary and secondary survey
Administering first aid to a miner with suspected head and neck injuries
Designed for underground coal miners

Location: Underground

Problem: You are a scoop operator in 31 to 35 inch coal. Your cousin Bud operates another scoop. When Bud is backing his scoop out of #1 entry, you hear his hat strike a low overhanging brow, followed by his cursing. He is OK. Now you must decide what to do to prevent an accident. Later an accident occurs in the same area. Now you have to decide what to do to help Bud.

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[1] You can do this yourself if you have the proper equipment, or you may wish to purchase copies of preprinted latent image answer sheets from the University of Kentucky, IMMR, 234 Mining and Minerals Resources Building, Lexington, KY 40506-0205, (606) 257-8636, or the National Mine Health and Safety Academy, P.O. Box 1166, Beckley, WV 25802-1166, (304) 255-0451.

HOW TO USE THIS EXERCISE

1. Look at the performance objectives. Decide if the exercise is relevant for your annual refresher class.

2. Work through the exercise with the special pen and score your responses.

3. Read the master answer sheet for the exercise. Look at all the answers.

4. Read the "Instructor's Discussion Notes" for the exercise.

5. Become thoroughly familiar with the problem so that you can present it to your class without reading it. Put the maps or illustrations on an overhead projector so you can use these to help explain the problem.

6. When you present the exercise to the class:

   - Explain that the answers from class members will be used to improve the exercise in the future.

   - Give each person an exercise booklet, an answer sheet, and a pen.

   - Demonstrate how to select and mark answers using the special pen.

   - Go over the instructions for doing the exercise with the whole group.

   - Explain the problem making sure everyone understands the problem situation.

   - Have the class members work the exercise.

   - When the class members finish, have them figure up their score using the instructions at the end of the exercise.

   - When everyone has finished, discuss the exercise. Let class members discuss the merits of each answer. Add your own ideas. Then have each person fill out the Trainee's Questionnaire attached to the answer sheet.

   - After class look over the completed trainee's questionnaires and the answer sheets. This information may provide ideas for improving the exercise for future classes. Write out your ideas for improving the exercise and send them to the following address.

IMMR/BRASH
201 Porter Building, University of Kentucky
Lexington, Kentucky 40506-0205 ph. (606) 257-3796

Performance Objectives for Traumatic Head Injury Exercise

Objective number	Capability verb(s)	Description of required performance and conditions under which it is to occur
1 HA*	Evaluate Select	An appropriate course of action, subsequent to a minor haulage accident in a low coal seam with irregular roof, to prevent a more serious accident
2 HA	Recognize Evaluate	A hazardous overhanging brow that should be reported to management
3 HA	Discriminate Identify	From among a set of reasonable measures, the best actions to take to prevent a reoccurrence of striking an overhang
4 HA/GC	Recognize Evaluate Select	Appropriate action subsequent to an unwitnessed probable haulage accident in a low coal seam with an irregular roof
5 FA	Recognize Assess Select	The most immediate concern for a victim of a neck-wrenching accident, and actions that could cause further injury
6 FA	Select Execute	Correct actions for conducting a primary survey for a suspected traumatic head injury
7 FA	Recall Evaluate Select	The seriousness of a suspected spinal injury and the importance of avoiding unnecessary movement of a victim

*Skill and knowledge domain abbreviations:
HA = haulage
GC = ground control
FA = first aid

Master Answer Sheet for Traumatic Head Injury Exercise

Use this answer sheet to mark your selections. Rub the special pen gently and smoothly between the brackets. Don't scrub the pen or the message may blur. Be sure to color in the entire message once you have made a selection. Otherwise you may not get the information you need.

Question A (Choose only ONE unless directed to "Try again!")

1. [There is a more critical first step. Try again!]
   [ ]

2. [Correct! Although you think he's not seriously injured due to his cursing, this]
   [is still a good idea. Do next question.]

3. [Bud may be injured. Try again!]
   [ ]

4. [Bud may be injured. Try again!]
   [ ]

Question B (Choose only ONE unless directed to "Try again!")

5. [A hazardous condition exists. Try again!]
   [ ]

6. [You need to do something now. Try again!]
   [ ]

7. [A hazardous condition exists. Try again!]
   [ ]

8. [Correct! This brow is a hazardous condition. It requires <u>immediate</u> attention]
   [before another similar accident occurs. Do next question.]

Question C (Choose only ONE unless directed to "Try again!")

9. [Correct! This is the best solution. This would eliminate the hazard, but might]
   [be difficult due to roof composition and layering. Color in the box under]
   [answer 14.]

10. [The 31"-35" mining height doesn't make this practical. Canopies are usually]
    [not used at such low mining heights. Try again!]

11. [This is only a short term solution. The hazard still exists. Try again!]
    [ ]

Question C (continued)

12. [Not a bad idea for the long-term, but there is a better first thing to do. Try again!]

13. [This could tear up the underclay bottom, making the roadways rough, rutted, and slippery. Try again!]

14. [Good idea, but there is a <u>better</u> first thing to do. Try again!]

[It is best to remove overhangs in heavy traffic areas as soon as possible. Meanwhile, everyone on the section should be made aware of hazards that result from changes in mining conditions or methods. Also, operators should be reminded to face the direction of travel. Do next question.]

Question D (Choose only ONE unless directed to "Try again!")

15. [Bud could be injured or ill! Try again!]

16. [Correct! Bud should have been on his way to the dump by now. He could be injured or ill. Do next question.]

17. [Your nearest buddies are a least two places over. Machinery is running, making it difficult to hear. Bud may be in trouble. Try again!]

18. [This would waste time. Bud could be in trouble. Try again!]

Question E (Choose only ONE unless directed to "Try again!")

19. [Bud may need your help <u>right now</u>. Try again!]

20. [This may injure Bud. Try again!]

21. [Correct! Do next question.]

22. [This may injure Bud. Try again!]

23. [Not a good idea. Try again!]

Question F (Select as MANY as you think are correct.)

24. [Correct! His breathing is now labored. When he breathes, only his abdomen moves. His chest is not moving.]

25. [Absolutely not! This could cause further serious injury.]

26. [Correct! There is no response on either one.]

27. [Correct! No bleeding is seen.]

28. [Correct! No blood or fluid is seen.]

29. [Correct! You detect no deformities in Bud's spine.]

30. [Correct! You find blood and a sunken area at the base of the skull.]

31. [This could cause further serious injury.]

32. [Correct! Both pupils constrict normally.]

33. [Correct! His pulse is about 120 and weak.]

34. [Absolutely not! This could cause further serious injury.]

Question G (Choose only ONE unless directed to "Try again!")

35. [This could cause further serious injury. Try again!]

36. [This could cause further serious injury. Try again!]

37. [Correct! Special care is required because a spinal injury is possible. Do next question.]

38. [Because there is no sign that his airway is obstructed, this should not be done. Try again!]

39. [This could cause further serious injury. Try again!]

Question H

END OF PROBLEM

Finding your score

Number of "Correct" answers you colored in = (1) _____

25 minus number of incorrect answers you colored in = (2)_____

Add blanks one and two to get your total score = (3)_____

Highest possible score = 39

Lowest possible score = 0

TRAINEE'S QUESTIONNAIRE

1) name of exercise _____

2) your age _____ 3) your sex _____ M _____ F 4) years underground coal miner _____

5) your job title _____

Check all the areas in which you have special training, certification, and/or that you routinely perform.

	Special Training	Certification	Routinely Perform
6) Mine Foreman	_____	_____	_____
7) Mine Safety Committee	_____	_____	_____
8) Mine rescue	_____	_____	_____
9) CPR	_____	_____	_____
10) Advanced first aid	_____	_____	_____
11) EMT	_____	_____	_____
12) Advanced life support	_____	_____	_____
13) Other (describe) _____	_____	_____	_____

Think about the exercise you just finished. Circle the number which tells how much you agree or disagree with the following statements.

	Definitely Yes			Definitely No
14) This problem could happen in real life.	4	3	2	1
15) This exercise will help me remember something important if I am ever in a similar situation.	4	3	2	1
16) I learned something new from the exercise.	4	3	2	1
17) The exercise took too long to complete.	4	3	2	1
18) I liked working the exercise.	4	3	2	1
19) The instructor's directions were clear.	4	3	2	1
20) The written directions in the exercise were easy to understand.	4	3	2	1
21) The diagrams, charts, and pictures were easy to understand.	4	3	2	1
22) The scoring procedures were easy to understand.	4	3	2	1
23) The exercise was easy to read.	4	3	2	1

If you have anything more to say about the exercise, please write on the back of this page. Thank you.

Instructor's Discussion Notes for Traumatic Head Injury Exercise

Use the information presented here and on the master answer sheet, your own ideas and experience and that of the miners in your class to discuss the exercise after it is completed. Group discussion can strengthen knowledge and skills, correct errors, and relate the exercise content to the experiences of the miners. After they have worked the exercise, miners enjoy discussing the problem. They also frequently think of better ways to respond to a problem than those listed among the answers. The purpose of the exercise is to help miners think about and remember basic knowledge and skills they may someday need to deal with a mine emergency. The discussion following the exercise can contribute to this goal and tailor the exercise content to the needs of the group you are training.

It is helpful to show overhead transparencies of the answers on the master answer sheet during the discussion, while the miners look at their problem booklets. This allows you to lead the group through the exercise and to discuss all the answers to each question. Most of the information about why particular answers are correct or incorrect is given on the master answer sheet.

The following notes provide additional information for you to discuss with your class. Read through and think about the notes before the class. Don't read the notes to the class members. This would be boring and ineffective. Rather, incorporate the ideas you find here with your own ideas and make these points at the appropriate place in the discussion of the exercise.

Question A - The correct answer is 2. The miners should realize that all accidents are potentially serious, even if no obvious injuries are seen. By asking Bud what happened, diagnosis is easier. All other responses are incorrect because immediate attention is not given to Bud, who could be injured.

Question B - The correct answer is 8. Most companies require that employees report hazardous conditions to the nearest supervisor. Discuss the consequences of waiting until later, or worse yet, not reporting this hazardous condition once it is recognized. Here, the hazard potential is greatly increased because of the low mining height and the absence of protective canopies, which are not required in mining heights of less than 42 inches.

Question C - The correct answer is 9. This question should generate discussion about the best measure(s) for preventing a similar occurrence. Rather than to protect mobile equipment operators from contacting the roof through installation of canopies (10), or by warning lights, or reflective signs, or tapes as required by 30 CFR 75.1403-10 (11), addressing the problem by removing the brow is best. Walking, tripping, and stumbling hazards (a very common and high incidence accident classification) are increased by taking out underclay bottom for additional clearance (13). Additional hazard training (12) and reminders about the proper operation of mobile equipment (14) should be routine and not a substitute for correcting a recognized hazard. Since it can be argued

that an imminent danger is posed by the brow, action should be quickly taken to remove it. If the overhang occurred in a less frequently traveled haul road, or if removal of the overhang is impractical, lights or reflective warnings should be installed.

Question D - The correct answer is 16. Miners should be aware of the expected location of other workers and equipment in the face area. From knowledge of where Bud usually is at the time the #2 scoop comes for another load, it is clear that something is wrong, either with the scoop or with Bud. All other responses postpone checking on Bud. The #2 scoop operator should have attempted to communicate with Bud before leaving the #1 entry for help. The accident had no witnesses and may have occurred several minutes earlier, so quick action is called for.

Question E - The correct answer is 21. The first step in first aid (assuming the environment is safe) is to assess the victim. The reasons for this are to prevent injury from inappropriate procedures (for example, see answers 20 and 23) and to make sure that the appropriate first aid is given as soon as possible.

By this point in the problem, the miners should have picked up clues that suggest Bud has a traumatic head injury. They should know that a neck injury must be assumed in this situation.

Question F - The correct answers are 24, 26, 27, 28, 29, 30, 32, and 33. The first steps of the assessment of the victim involve checking the airway, breathing, and circulation (A, B, C). Phillips (see references) adds a "D" to this "primary survey" which stands for "delicate central nervous system." In this step the victim's responsiveness and neck and spine are evaluated. If the victim is not found to need immediate first aid during the primary survey, a "secondary (head to toe) survey" is carried out. If a neck injury is suspected, the victim should not be moved unnecessarily during these examinations. Even though no deformities were felt, one cannot rule out a possible spinal injury. Also, in such low coal situations, it might be difficult to look into the victim's ears and nose (28), check his neck and spine (29), feel his skull (30), and check his pupils (32), without moving the victim. This is an opportunity to discuss potential complications to the administration of first aid, including: 1) awkward position of the victim, 2) limited, encumbered space, 3) difficulties presented by a victim who resists treatment, and 4) conflicting symptoms, making diagnosis uncertain.

Question G - The correct answer is 37. The results of the examinations in the previous questions further support the suspicion of neck injury. In this situation the first aider should manually immobilize the victim's head until more help and further means of imobilization arrive. A "jaw thrust" maneuver should be attempted only if there are signs of airway obstruction.

References

Bergeron, J. D. (1982). First responder. Bowie, MD: Robert J. Brady Co.

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Campbell, J. E. (1985). Basic trauma life support: Advanced prehospital care. Bowie, MD: Brady Communications Co.

O'Bryan, M. (1979). Report of investigation (Fatal Powered Haulage Accident). Mine ID No. 44-00749, Buchanan County, VA. Arlington, VA: MSHA.

Office of the Federal Register. (July 1984). Code of federal regulation. Title 30 (Part 75). Washington, DC: U.S. Government Printing Office.

Scoring Key for Traumatic Head Injury Exercise

Question A

1. __W__
2. __R__
3. __W__
4. __W__

Question B

5. __W__
6. __W__
7. __W__
8. __R__

Question C

9. __R__
10. __W__
11. __W__
12. __W__
13. __W__
14. __W__

Question D

15. __W__
16. __R__
17. __W__
18. __W__

Question E

19. __W__
20. __W__
21. __R__
22. __W__
23. __W__

Question F

24. __R__
25. __W__
26. __R__
27. __R__
28. __R__
29. __R__
30. __R__
31. __W__

Question F(con't)

32. __R__
33. __R__
34. __W__

Question G

35. __W__
36. __W__
37. __R__
38. __W__
39. __W__

Summary of Field Test Results

The Traumatic Head Injury Exercise (THI) underwent two rounds of field testing, including authentication and one field test. The authentication consisted of a small initial field test that produced too little data for meaningful statistical summaries, but many comments, criticism, and suggestions that were used to revise and improve the exercise before the first formal field test. The formal field test involved carefully controlled administration of the revised exercise to groups of miners at multiple sites. The field test resulted in data used to revise and improve the exercise prior to the next field test of the new version. Tables that summarize the results of the field test for THI1 are attached. The version of the exercise included in this document includes all of the cumulative revisions made as a result of the three rounds of field tests.

THI1 was tested with 52 miners, in 3 classes, at 3 sites. Each set of tables is divided into two parts. The first part describes the people who participated in the field test and their evaluation of the exercise. The second part describes the measurement properties of the exercise.

Sample characteristics and miners' evaluations

Tables 1 through 3 describe demographic characteristics of the sample. Table 4 indicates the number of persons in the sample who reported either some training, special certification, and/or routine performance of the eight areas listed as rows in the table. Inspection of these tables quickly reveals the numbers and types of persons involved in the field test of the exercise.

Table 5 reports the miners' judgment of the exercise quality and worth. Each person was asked to rate the value of the exercise on each of ten qualities. By checking a number on a scale, miners indicated to what extent the exercise displayed each quality. Inspection of the values in Table 5 reveals the percentage of miners who reported that the exercise 1) was realistic, 2) helped them to remember important things, 3) helped them learn something new, 4) was too long, 5) was enjoyable, 6) should be used in other classes, 7) instructor's directions were clear, 8) written directions were clear, 9) illustrations and maps were clear, 10) scoring procedures were easy to understand, and 11) was easy to read.

Psychometric properties

The next set of tables describe the psychometric (mental performance measurement) properties of the exercise. Table 6 presents summary data for each of the exercise questions, including the minimum, maximum, median, and mean question scores observed in the sample; the standard deviation and skewness of each question score; the squared correlation coefficient of each individual question score with the exercise total score; and the estimated reliability of the total exercise score if that particular question were dropped from the test. The last line in Table 6 reports the same information for the total exercise score. This is obtained by summing question scores

across the whole exercise. Each question is weighted such that a perfect score on each question sums to 100 for the exercise total score. Inspection of the table quickly presents the basic performance data for the sample.

The weighting of each question score to produce a total score of 100 is designed to allow comparison of the difficulty of different versions of the same exercise, or different exercises, even though these often have different numbers of questions. The total score of 100 is also a common convention for reporting test scores.

Table 7 reports the number of answers (options) to questions that discriminated properly between persons with high scores on the test and those persons with low scores. Tests that have multiple choice answers to questions must include some incorrect and some correct answers. The person who takes the test must choose among correct and incorrect answers (distractors) to each question. Persons who get a high total score on the test know more about the test content than persons who get low scores. Therefore, when data are aggregated from the whole sample of persons who took the test, wrong answers (distractors) to each question on the test should be significantly negatively correlated with the overall test score, and correct answers to questions should be significantly positively correlated with the exercise total score. When correct answers and wrong answers (distractors) behave this way, the answer (whether correct or incorrect) is said to positively discriminate between persons who know much about the content and those who know little. However, when persons who get high scores on the total test tend to pick wrong answers (distractors) more frequently than persons who get low scores, the answer is said to reverse or negatively discriminate. The opposite case is also true. That is, when persons who get low scores on the total test score tend to pick a right answer to a question more frequently than persons who had high total test scores, that answer is also said to reverse or negatively discriminate. The discrimination values are used to identify and correct problems in the answers for questions. To be valid, the method requires an adequate sample of persons who exhibit a wide range of variability in their total test scores.

Table 7 reports the frequency with which answers to questions behaved in this desirable way. The table tells the percentage of answers to questions on the test that discriminated positively, negatively, or not at all among the ability levels represented in the field test sample.

Another way to look at the discrimination capability of a test is to divide the sample into groups of persons with greater or lesser levels of expertise. Table 8 reports the degree to which the exercise total score discriminated between persons in the sample with different levels of self-reported expertise. For example, Table 8 shows that the THI exercise did not discriminate significantly between those persons who said they had some mine rescue or other technical mining training and those who did not report such training. The means and standard deviations for these two groups are given as well as the F ratio and the p value.

Finally, the last table is another discrimination analysis for the total exercise score, this time between the self-reported major job categories represented in the sample. The

category "miners" includes all working miners who are not supervisors, surveyors, engineers, etc. The "maintenance/technical" category includes all inspectors, engineers, surveyors, electricians, mechanics, and other technical and maintenance personnel who work in the mines and typically have special skills, and who move from section to section as they complete their work. The "supervisory/management" category includes all managers from the mine section foreman on up. The "other" category includes all other persons such as preparation plant and surface mine workers, personnel, office staff, and others who are not miners but who often participate in annual refresher training classes.

The number of miners reported in the tables varies. This is because not all miners answered all of the questions on the trainee's questionnaire. Also, some of the data received from the field tests reflect individual performances, while other data reflect small group performance. Instructors often had the miners work the exercise in small groups. This is a good instructional procedure that miners enjoy. However, the psychometric studies require individual exercise administration in order to carry out the discrimination analyses. Therefore, Tables 1 through 5 report the actual or valid percent of persons who responded to specific items on the trainee's questionnaire. The remainder of the psychometric tables report data for the number of persons who properly completed the exercise individually.

Characteristics of the THI Exercise

Miners who completed the exercise judged it favorably. The exercise did not discriminate between levels of training or among job categories. This is probably because the exercise content is basic first aid and routine safety procedures. All persons in the sample across levels of training and job categories were generally adept at these basic skills and knowledge. The mean score on THI1 was 83.3 with a standard deviation of 9.42. Although the exercise is moderately easy for most miners, a number of miners make errors in critical skills that should be learned to perfection. Miners and trainers report the exercise is useful in teaching and reinforcing these critical skills.

Characteristics of the field test sample for THI1 Exercise

(3 sites, 3 classes, n = 57)

Table 1: Age and experience of miners (years)

	n	mode	mean	s.d.
age	53	36	39.0	8.24
experience	49	14	14.0	5.62

Table 2: Gender distribution (%)

	n	frequency %
female	0	0.0
male	57	100.0

Table 3: Job classification

	n	frequency %
miner	29	63.0
maintenance/technical	8	17.4
supervisory/management	7	15.2
other	2	4.3

Table 4: Self-reported level of expertise (frequency %)

category	training	certification	performance
foreman	11.5	28.8	1.9
mine safety committee	0.0	0.0	0.0
mine rescue	3.8	1.9	0.0
CPR	9.6	15.4	3.8
advanced first aid	15.4	9.6	1.9
EMT	7.7	15.4	1.9
advanced life support	0.0	0.0	0.0
other	1.9	1.9	1.9

Table 5: Miners' rating of exercise validity, relevance, quality, and utility

content	definitely yes			definitely no	mean	s.d.
	4	3	2	1		
problem could happen	93.6	6.4	0.0	0.0	3.9	0.24
help remember important things	65.2	28.3	6.5	0.0	3.5	0.61
learned something new	51.1	26.7	11.1	11.1	3.1	1.02
exercise too long	16.3	7.0	4.7	72.1	1.7	1.17
should use	81.8	18.2	0.0	0.0	3.8	0.39
liked working the exercise	77.8	15.6	2.2	4.4	3.6	0.73
instructor 's directions clear	82.6	13.0	4.3	0.0	3.7	0.51
written exercise directions clear	78.3	19.6	2.2	0.0	3.7	0.48
graphics easy to understand	79.5	13.6	2.3	4.5	3.6	0.74
scoring easy to understand	87.0	13.0	0.0	0.0	3.8	0.34
exercise easy to read	0.0	0.0	0.0	0.0	0.0	0.00

Psychometric properties of THI1 Exercise

(printout date 5/15/87, 3 sites, 3 classes, n = 52)

Table 6: Question score and total score statistics

question	minimum score*	maximum score*	median	mean	s.d.	skewness	R^2_{QT}	alpha if question deleted
A	0.0	14.3	14.3	12.7	3.14	-2.20	0.16	0.46
B	7.1	14.3	14.3	12.4	2.43	-0.91	0.25	0.39
C	0.0	11.4	8.6	6.7	3.05	-1.24	0.10	0.45
D	0.0	14.3	14.3	13.8	2.13	-5.38	0.55	0.48
E	0.0	14.3	14.3	12.5	3.01	-1.91	0.10	0.52
F	4.3	14.3	12.9	11.4	3.47	-1.08	0.33	0.43
G	3.6	14.3	14.3	13.7	2.04	-3.59	0.25	0.39
Total	54.3	94.3	86.0	83.3	9.42	-1.06	(alpha = 0.51)	

*The values reported are the minimum and maximum scores observed, for this sample. The lowest possible score = 0 and the highest possible score = 14.3. When scores are summed across questions the highest possible score = 100 and the lowest possible score = 0.

Table 7: Proportion of answers discriminating positively, negatively, and not at all with exercise total score ($p<.10$)

positive	negative	no relationship
32/39 (82.0%)	0/39 (0.0%)	7/39 (18.0%)

Table 8: Discrimination between basic and advanced levels of mine rescue/technical training

	n	mean	s.d.	F ratio	p value
basic	35	83.0	9.68	0.225	0.637
advanced	16	84.3	9.78		

Table 9: Discrimination between basic and advanced levels of first aid training

	n	mean	s.d.	F ratio	p value
basic	34	82.7	9.67	0.491	0.487
advanced	17	84.7	8.78		

Table 10: Discrimination between job categories

	n	mean	s.d.	F ratio	p value
miner	28	84.9	7.48	0.780	0.512
main/tech	8	86.1	4.61		
super/mgt	7	81.2	11.21		
other	2	88.9	3.54		

Questions that discriminate significantly at $p < .10$: C, $p = .005$

Appendix A: Problem Booklet

Duplicate this copy of the problem booklet for use in your classes. Each person in your class should have a problem booklet while they are working the exercise. The problem booklets are reusable. To save effort and money, ask the trainees to avoid marking in the booklets and collect all the booklets after the class.

You may obtain copies of the problem booklet from the University of Kentucky or the National Mine Health and Safety Academy. The addresses and telephone numbers for these two agencies are listed in the footnote on page three of this document.

Traumatic Head Injury Exercise

Problem Booklet

Behavioral Research Aspects of Safety
and Health Group (BRASH)
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Instructions

Read the problem situation described on the next page. Then answer each of the eight questions. Do them one at a time. Don't jump ahead, but you may look back to earlier questions and answers. Most questions direct you to choose only one answer unless you are told to "Try again!" One question asks you to select as many answers as you think are correct. Follow the instructions for each question.

After you have selected your choice to a question, look up its number on the answer sheet. Select your answer to each question by rubbing the special pen between the brackets on the answer sheet. A hidden message will appear and tell you if you are right. When you have finished you will learn how to score your performance.

Traumatic Head Injury Exercise

Background

The mine is nongassy in a 31"-35" seam with a thick slate top and underclay bottom.

The top is good and the section was firebossed prior to beginning the shift.

The face is 800 feet away from the portal.

This is a conventional section, but no loader is in use.

Two scoops are used for loading and face haulage; neither has a canopy.

It is 7:30 a.m. and day shift has just begun.

The seam pinches out on the section's left side, causing the scoops to drag the roof and knock out roof bolts in the #1 and #2 entries. Eight to ten inches of immediate roof were taken on the previous shift for additional vertical clearance. This has left a severe overhanging brow in #1 and #2 entries.

Yesterday, you and Bud loaded the rock and coal out of #1 and #2 after the extra roof was taken down for more clearance.

Problem

You are the #2 scoop operator. You are tightening the line curtain near the #1 face. (See Figure 1.) Your cousin, Bud Jackson, has nearly finished loading out #1, which was shot down at the end of the last shift. You hear a sound like a hard hat striking the roof and then considerable cursing. You look up toward the face and see a swinging cap lamp.

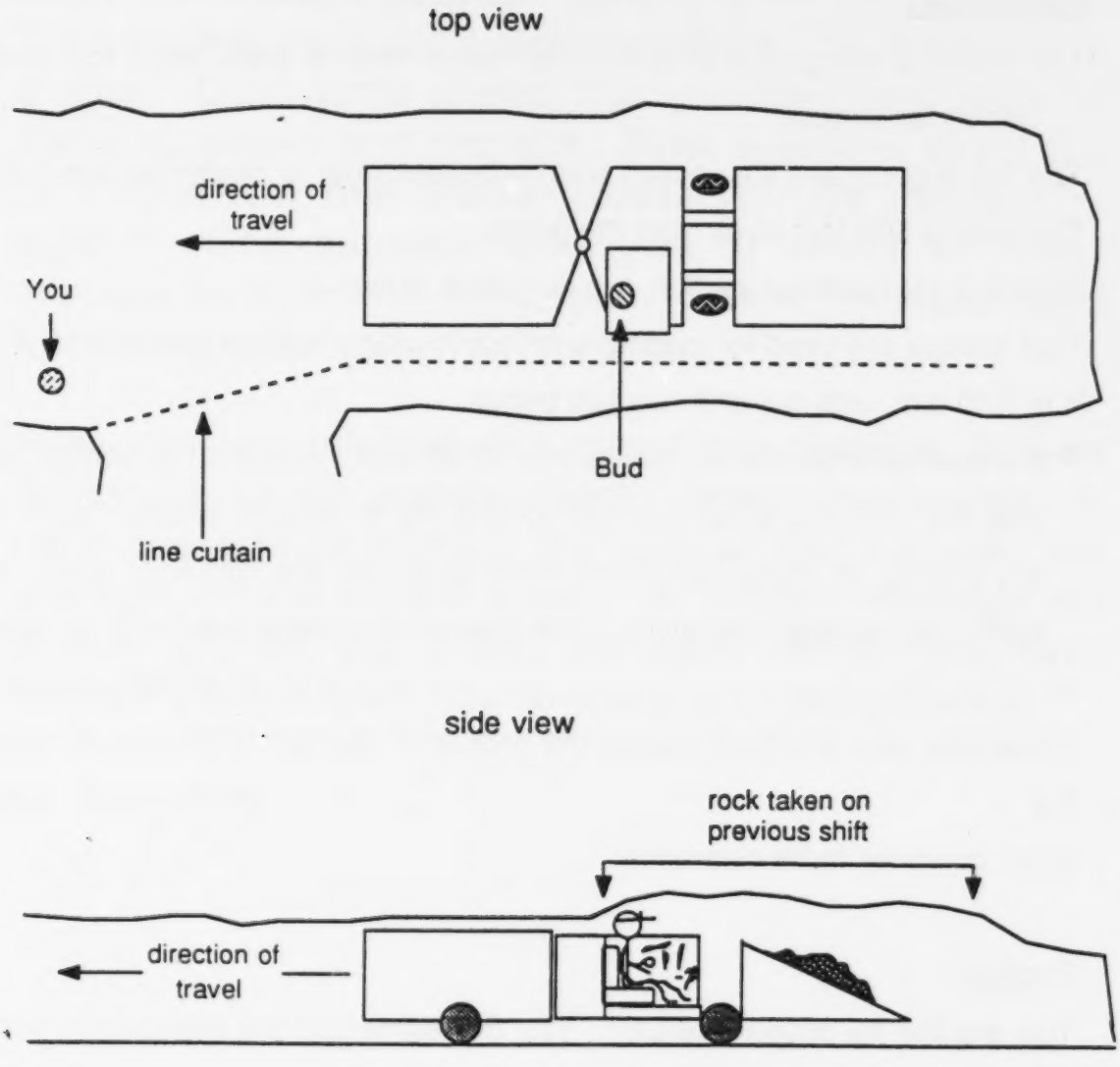

Figure 1: Top and side views of the #1 entry

Question A

Bud puts his hard hat back on and gets out of his scoop. What would you do now? (Choose only ONE unless directed to "Try again!")

1. Go across the section and find the section boss to tell him what happened.
2. Crawl quickly up to Bud, check him for injuries, and ask what happened.
3. Yell at Bud, make sure he's OK, and continue your job.
4. Yell at Bud, make sure he's OK, and go find the section boss to tell him what happened.

Question B

Bud says "I'm OK. I hit my head on the brow that was left when we started taking extra top yesterday." You try to pull the brow down with a slate bar, but it is too large and solid. What would you do now? (Choose only ONE unless directed to "Try again!")

5. Satisfied that Bud is OK, go back to what you were doing.

6. Satisfied that Bud is OK, go back to work. You know it's important to tell your boss, but you can tell him at lunch time.

7. Tell Bud to pay more attention to what he's doing and go back to hanging curtain.

8. Immediately tell the section boss what happened.

Question C

You and Bud go tell the section boss what happened. The three of you talk about the risk of serious injury due to striking the roof or becoming caught between an overhang and the scoop frame. What is the best thing to do at this time to prevent a serious accident? (Choose only ONE unless directed to "Try again!")

9. Find a way to remove the brow to make the slope more gradual.

10. Install a canopy on the scoop and on all other mobile equipment on the section.

11. Put reflectors on the brow and along the ribs to warn of the sudden change of mining height.

12. Give additional hazard training to all miners on the section, particularly the mobile equipment operators.

13. Take bottom instead of top for additional clearance.

14. Remind all operators to always face the direction of travel when operating a piece of mobile equipment.

Question D

After lunch, loading continues. The brow has not yet been removed. You and Bud are loading out the #1 face. Your section boss has cautioned you both about the overhangs in #1 and #2. He says at the end of the shift he'll send in the pinner to take down the brow and to re-bolt. Ten minutes later you are returning for your fifth scoop of coal. You see that Bud's #1 scoop is still in the face. What would you do now? (Choose only ONE unless directed to "Try again!")

15. Assume that Bud's scoop has broken down. Back up toward the #2 entry, turn around, and go find the mechanic.

16. Park your #2 scoop a safe distance from Bud's and go see if something is wrong.

17. Holler to your buddies for help, wait for them to come, and then check on Bud.

18. Tram across the section, looking for the section boss.

Question E

You go up to the scoop which is stopped in the area of the overhang. The scoop is not running. You find Bud slumped over in the cab. He is muttering something you can't understand. What should you do now? (Choose only ONE unless directed to "Try again!")

19. Go for help.

20. Pull Bud from the operator's compartment.

21. Check Bud for injuries.

22. Tilt Bud's head back to open his airway.

23. Start Bud's scoop and move it a few feet inby the overhang where there is more overhead clearance.

Question F

A buddy arrives. You ask him to go for first aid supplies and to get help. Bud is still muttering under his breath as you check him for injuries. How should you check him? (Select as MANY as you think are correct.)

24. Check his breathing.

25. Turn his head from side to side.

26. Scratch each of his palms with your fingernail.

27. Look for bleeding.

28. Look in his ears and nose without tilting his head.

29. Gently run your fingers down his neck and spine, being careful not to move him.

30. Feel his skull with your fingertips.

31. Tilt him back in the seat and look at his chest.

32. Check his pupils without tilting his head.

33. Take his pulse.

34. Ask him if he can move his head from side to side.

WHEN YOU HAVE MADE YOUR SELECTION(S) DO THE NEXT QUESTION.

Question G

Your buddy returns with the first aid kit and stretcher board and says that the EMT and others are on the way. What should you do now? (Choose only ONE unless directed to "Try again!")

35. Tell your buddy to help you lift Bud onto the stretcher board and then immobilize him.

36. Tell your buddy to help slide Bud onto the stretcher board. Then elevate the foot end 12 inches.

37. Immobilize Bud's head, continue checking his pulse and breathing, and wait for help.

38. Maintain Bud's airway by using a "jaw-thrust" maneuver and wait for help.

39. Apply pressure to the sunken area of the skull with a sterile dressing.

Bud was properly immobilized, put on a stretcher board, and quickly taken outside, where he was transferred to an awaiting ambulance. Bud suffered a skull fracture and a concussion, but was able to return to work within two months.

Question H

List all the violations of state and federal laws and company rules that you can find in this problem. Write your answer on the lines on the answer sheet.

END OF PROBLEM

Scoring your performance

1. Count the total number of responses you colored in that were marked "Correct!" Write this number in the first blank on the answer sheet.

2. Count the total number of "incorrect" responses you colored in. Subtract this number from 25. Write the difference in the second blank on the answer sheet.

3. Add the numbers in the first and second blanks. This is your score.

The best possible score of 39 results from selecting all the correct answers and no wrong answers. The worst possible score of zero results from selecting all the wrong answers and no correct answers.

Appendix B: Answer Sheet Blanks

These are the answer sheet blanks. Copies of these blank answer sheets may be duplicated in the normal fashion. However, the answers that are found within the brackets must be printed on these blank answer sheets in latent image ink. These answers are found in Appendix C. If you have the capability to print latent image ink, make copies of the blank answer sheets. Then make a mimeograph master of the latent image answers that appear in Appendix C. Then print the invisible latent image ink on the blank answer sheets, being careful to make sure all pages print and that the appropriate answers line up with the appropriate blanks. The Master Answer Sheet in the first part of this document shows all the latent image answers in their proper place.

Most companies and trainers prefer to purchase preprinted answer sheets. You may obtain copies of preprinted latent image answer sheets from the University of Kentucky or the National Mine Health and Safety Academy. The addresses and telephone numbers for these two agencies are listed in the footnote on page 3 of this document. Instructions for printing your own latent image answer sheets are also available from these two agencies.

The exercise may be administered in small groups or individually. Used individually, you will need one answer sheet for each person in your class. If you use the exercise in small groups, you will need one answer sheet for each 3 to 5 persons in your class. The answer sheets are consumable. You will need a new set for each class.

Special latent image marking pens are also needed by each person who marks an answer sheet. These may be obtained from the University of Kentucky IMMR office or the National Mine Health and Safety Academy. The addresses and telephone numbers for these two agencies are listed in the footnote on page 3 of this document. You may also purchase latent image marking pens and latent image ink supplies from A. B. Dick Company, 5700 West Touhy Avenue, Chicago, Illinois 60648, (312) 763-1900. The A. B. Dick Chicago Office can put you in touch with the local supplier for your area.

Answer Sheet for Traumatic Head Injury Exercise

Use this answer sheet to mark your selections. Rub the special pen gently and smoothly between the brackets. Don't scrub the pen or the message may blur. Be sure to color in the entire message once you have made a selection. Otherwise you may not get the information you need.

Question A (Choose only ONE unless directed to "Try again!")

1. [ ]
   [ ]

2. [ ]
   [ ]

3. [ ]
   [ ]

4. [ ]
   [ ]

Question B (Choose only ONE unless directed to "Try again!")

5. [ ]
   [ ]

6. [ ]
   [ ]

7. [ ]
   [ ]

8. [ ]
   [ ]

Question C (Choose only ONE unless directed to "Try again!")

9. [ ]
   [ ]
   [ ]

10. [ ]
    [ ]

11. [ ]
    [ ]

Question C (continued)

12. [ ]
    [ ]

13. [ ]
    [ ]

14. [ ]
    [ ]

[ ]
[ ]
[ ]
[ ]

Question D (Choose only ONE unless directed to "Try again!")

15. [ ]
    [ ]

16. [ ]
    [ ]

17. [ ]
    [ ]

18. [ ]
    [ ]

Question E (Choose only ONE unless directed to "Try again!")

19. [ ]

20. [ ]

21. [ ]

22. [ ]

23. [ ]

Question F (Select as MANY as you think are correct.)

24. [ ]
    [ ]

25. [ ]

26. [ ]

27. [ ]

28. [ ]

29. [ ]

30. [ ]

31. [ ]

32. [ ]

33. [ ]

34. [ ]

Question G (Choose only ONE unless directed to "Try again!")

35. [ ]

36. [ ]

37. [ ]
    [ ]

38. [ ]
    [ ]

39. [ ]

Question H

_____ _____

_____ _____

_____ _____

_____ _____

_____ _____

_____ _____

END OF PROBLEM

Finding your s ore

Number of "Corre t" answers you colored in = (1) _____

25 minus numbe of incorrect answers you colored in = (2)_____

Add blanks one a d two to get your total score = (3)_____

Highest possible core = 39

Lowest possible core = 0

TRAINEE'S QUESTIONNAIRE

1) name of exercise _____

2) your age _____ 3) your sex _____ M _____ F 4) years underground coal miner _____

5) your job title _____

Check all the areas in which you have special training, certification, and/or that you routinely perform.

	Special Training	Certification	Routinely Perform
6) Mine Foreman	_____	_____	_____
7) Mine Safety Committee	_____	_____	_____
8) Mine rescue	_____	_____	_____
9) CPR	_____	_____	_____
10) Advanced first aid	_____	_____	_____
11) EMT	_____	_____	_____
12) Advanced life support	_____	_____	_____
13) Other (describe) _____	_____	_____	_____

Think about the exercise you just finished. Circle the number which tells how much you agree or disagree with the following statements.

	Definitely Yes			Definitely No
14) This problem could happen in real life.	4	3	2	1
15) This exercise will help me remember something important if I am ever in a similar situation.	4	3	2	1
16) I learned something new from the exercise.	4	3	2	1
17) The exercise took too long to complete.	4	3	2	1
18) I liked working the exercise.	4	3	2	1
19) The instructor's directions were clear.	4	3	2	1
20) The written directions in the exercise were easy to understand.	4	3	2	1
21) The diagrams, charts, and pictures were easy to understand.	4	3	2	1
22) The scoring procedures were easy to understand.	4	3	2	1
23) The exercise was easy to read.	4	3	2	1

If you have anything more to say about the exercise, please write on the back of this page. Thank you.

Appendix C: Latent Image Answers

These pages contain the latent image answers that must be printed in the blanks of the answer sheet in Appendix B. These answers are spaced and sequenced correctly so that they exactly match up with the appropriate brackets on the answer sheet blanks.

Once the latent image ink answers have been printed on the answer sheet blanks, the special developing pen reveals the formerly invisible (latent image) printed message.

You may purchase preprinted answer sheets or you may prepare your own copies. To learn more about this option, and to determine how many answer sheets and special pens you will need, see the introductory section for Appendix B.

There is a more critical first step. Try again!

Correct! Although you think he's not seriously injured due to his cursing, this is still a good idea. Do next question.

Bud may be injured. Try again!

Bud may be injured. Try again!

A hazardous condition exists. Try again!

You need to do something now. Try again!

A hazardous condition exists. Try again!

Correct! This brow is a hazardous condition. It requires <u>immediate</u> attention before another similar accident occurs. Do next question.

Correct! This is the best solution. This would eliminate the hazard, but might be difficult due to roof composition and layering. Color in the box under answer 14.

The 31"-35" mining height doesn't make this practical. Canopies are usually not used at such low mining heights. Try again!

This is only a short term solution. The hazard still exists. Try again!

Not a bad idea for the long-term, but there is a better first thing to do. Try again!

This could tear up the underclay bottom, making the roadways rough, rutted, and slippery. Try again!

Good idea, but there is a <u>better</u> first thing to do. Try again!

It is best to remove overhangs in heavy traffic areas as soon as possible. Meanwhile, everyone on the section should be made aware of hazards that result from changes in mining conditions or methods. Also, operators should be reminded to face the direction of travel. Do next question.

Bud could be injured or ill! Try again!

Correct! Bud should have been on his way to the dump by now. He could be injured or ill. Do next question.

Your nearest buddies are a least two places over. Machinery is running, making it difficult to hear. Bud may be in trouble. Try again!

This would waste time. Bud could be in trouble. Try again!

Bud may need your help <u>right now</u>. Try again!

This may injure Bud. Try again!

Correct! Do next question.

This may injure Bud. Try again!

Not a good idea. Try again!

Correct! His breathing is now labored. When he breathes, only his abdomen moves. His chest is not moving.

Absolutely not! This could cause further serious injury.

Correct! There is no response on either one.

Correct! No bleeding is seen.

Correct! No blood or fluid is seen.

Correct! You detect no deformities in Bud's spine.

Correct! You find blood and a sunken area at the base of the skull.

This could cause further serious injury.

Correct! Both pupils constrict normally.

Correct! His pulse is about 120 and weak.

Absolutely not! This could cause further serious injury.

This could cause further serious injury. Try again!

This could cause further serious injury. Try again!

Correct! Special care is required because a spinal injury is possible. Do next question.

Because there is no sign that his airway is obstructed, this should not be done. Try again!

This could cause further serious injury. Try again!